In the Claims

Cancel claims 1-36, 40-42 and 44-83.

Amend claims 37-39 and 43 to read as follows:

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37. (Once Amended) A method according to claim 126 wherein said selected moveable output optical element is capable of at least one of: directing said selected output optical channel to receive said input optical communication signal and directing said input optical communication signal to be received by said selected output optical channel.

and

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38. (Once Amended) A method according to claim 126 wherein the selected moveable output optical element comprises at least one of: a receiving end of the selected output optical channel and a transmitting end of a selected input optical channel associated with the input optical communication signal.

39. (Once Amended) A method according to claim 126 wherein the selected moveable output optical element comprises at least one of: (a) an end of a first optical fiber associated with the selected output optical channel; (b) an end of a second optical fiber, the second optical fiber associated with a selected input optical channel that emitted the input optical communication signal; and (c) an optical element operative to influence an optical path of the input optical communication signal between said first and second optical fibers.

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and

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43. (Once Amended) A switch according to claim 84 wherein each position encoder is operative to determine, from the corresponding output control signal, a position of at least one of: (i) an end of an optical fiber corresponding to the associated output optical channel; and (ii) an optical element operative to influence an optical path of optical communications signals associated with said fiber.

Add new claims 84-155 as follows:

a4

84. (New) An optical cross-connect switch for switching optical communications signals, the switch comprising:

a first optical system configured to project one or more first control signal radiation patterns;

a plurality of output optical channels;

a plurality of output encoders, each output encoder associated with one of the plurality of output optical channels, each output encoder positioned, relative to the associated output optical channel and the first optical system, to receive the one or more first control signal radiation patterns and to detect at least a portion of one or more corresponding output Moiré interference patterns produced by the one or more first control signal radiation patterns;

wherein each output encoder is configured to generate a corresponding output control signal indicative of an intensity of detected output Moiré interference patterns.

85. (New) A switch according to claim 84 wherein each output encoder comprises an associated output reticle, each output reticle having a spatially varying pattern of interaction with radiation incident thereon.

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86. (New) A switch according to claim 85 wherein each output reticle is positioned to receive the one or more first control signal radiation patterns and to produce the one or more corresponding output Moiré interference patterns in response thereto.

87. (New) A switch according to claim 86 wherein each output encoder comprises an associated output radiation sensor, each output radiation sensor positioned to detect at least a portion of the one or more corresponding output Moiré interference patterns and configured to generate the corresponding output control signal.

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88. (New) A switch according to claim 87 comprising:

a second optical system configured to project one or more second control signal radiation patterns;

a plurality of input optical channels;

a plurality of input encoders, each input encoder associated with one of the plurality of input optical

channels, each input encoder positioned, relative to the associated input optical channel and the second optical system, to receive the one or more second control signal radiation patterns and to detect at least a portion of one or more corresponding input Moiré interference patterns produced by the one or more second control signal radiation patterns;

wherein each input encoder is configured to generate a corresponding input control signal indicative of an intensity of detected input Moiré interference patterns.

89. (New) A switch according to claim 88 wherein each input encoder comprises an associated input reticle, each input reticle having a spatially varying pattern of interaction with radiation incident thereon.

90. (New) A switch according to claim 89 wherein each input reticle is positioned to receive the one or more second control signal radiation patterns and to produce the one or more corresponding input Moiré interference patterns in response thereto.

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91. (New) A switch according to claim 90 wherein each input encoder comprises an associated input radiation sensor, each input radiation sensor positioned to detect at least a portion of the one or more corresponding input Moiré interference patterns and configured to generate the corresponding input control signal.

92. (New) A switch according to claim 91 comprising a controller connected to receive the input and output control signals the controller configured to determine a position of each output reticle based on the corresponding output control signal and configured to determine a position of each input reticle based on the corresponding input control signal.

93. (New) A switch according to claim 91 wherein each of the output reticles has a spatially varying transmissivity and each associated output radiation sensor is located to detect radiation from the one or more first control

signal radiation patterns that has passed through the associated output reticle and each of the input reticles has a spatially varying transmissivity and each associated input radiation sensor is located to detect radiation from the one or more second control signal radiation patterns that has passed through the associated input reticle.

94. (New) A switch according to claim 91 wherein each of the output reticles has a spatially varying reflectivity and each associated output radiation sensor is located to detect radiation from the one or more first control signal radiation patterns that has reflected from the associated output reticle and each of the input reticles has a spatially varying reflectivity and each associated input radiation sensor is located to detect radiation from the one or more second control signal radiation patterns that has reflected from the associated input reticle.

95. (New) A switch according to claim 91 wherein each of the input and output reticles is patterned with a regular array of cells.

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96. (New) A switch according to claim 95 wherein each of the cells comprises an aperture portion and an opaque portion and wherein:

(a) each output reticle passes a first proportion of the first control signal radiation patterns incident on the aperture portion to the associated output radiation sensor and each output reticle passes a second proportion, smaller than the first proportion, of the first control signal radiation patterns incident on the opaque portion to the associated output radiation sensor; and

(b) each input reticle passes a first proportion of the second control signal radiation patterns incident on the aperture portion to the associated input radiation sensor and each input reticle passes a second proportion, smaller than the first proportion, of the second control signal radiation patterns incident on the opaque portion to the associated input radiation sensor.

97. (New) A switch according to claim 91 wherein each of the input and output reticles comprises a circularly symmetric pattern of aperture areas and opaque areas and wherein:

(a) each output reticle passes a first proportion of the first control signal radiation patterns incident on the aperture areas to the associated output radiation sensor and each output reticle passes a second proportion, smaller than the first proportion, of the first control signal radiation patterns incident on the opaque areas to the associated output radiation sensor; and

(b) each input reticle passes a first proportion of the second control signal radiation patterns incident on the aperture areas to the associated input radiation sensor and each input reticle passes a second proportion, smaller than the first proportion, of the second control signal radiation patterns incident on the opaque areas to the associated input radiation sensor.

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98. (New) A switch according to claim 91 wherein each of the one or more first and second control signal radiation patterns comprises a plurality of elongated stripes of radiation.

99. (New) A switch according to claim 91 wherein each of the one or more first and second control signal radiation patterns comprises a spatially periodic radiation pattern.

100. (New) A switch according to claim 95 wherein each of the one or more ~~first~~ control signal radiation patterns comprises a spatially periodic radiation pattern having a period substantially equal to a spatial periodicity of the cells on the output reticles and each of the one or more second control signal radiation patterns comprises a spatially periodic radiation pattern having a period substantially equal to a spatial periodicity of the cells on the input reticles.

101. (New) A switch according to claim 100 wherein the cells on the input and output reticles are arranged in rows extending substantially parallel to a first axis and columns extending substantially parallel to a second axis and each of the one or more first and second control signal radiation patterns comprises elongated stripes which are oriented substantially parallel to one of the first and second axes.

102. (New) A switch according to claim 91 wherein the one or more first control signal radiation patterns comprise at least one radiation pattern having a first wavelength and at least one radiation pattern having a second wavelength and the one or more second control signal radiation patterns comprise at least one radiation pattern having the first wavelength and at least one radiation pattern having the second wavelength.

103. (New) A switch according to claim 91 wherein the first optical system comprises an array of first radiation emitting devices located in positions optically opposing the plurality of output optical channels and the second optical system comprises an array of second radiation emitting devices located in positions optically opposing the plurality of input optical channels.

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104. (New) A switch according to claim 103 wherein the first optical system is configured to project the one or more first control signal radiation patterns by turning on selected pluralities of the first radiation emitting devices and the second optical system is configured to project the one or more second control signal radiation patterns by turning on selected pluralities of the second radiation emitting devices.

105. (New) A switch according to claim 103 wherein individual ones of the first radiation emitting devices are located between the input optical channels and individual ones of the second radiation emitting devices are located between the output optical channels.

106. (New) A switch according to claim 91 wherein each output encoder comprises an associated output lens, each output lens located and shaped to focus the one or more first control signal radiation patterns onto the associated output reticle and each input encoder comprises an associated input lens, each input lens located and shaped to focus the one or more second control signal radiation patterns onto the associated input reticle.

107. (New) A switch according to claim 106 wherein each output lens is located and shaped to couple an optical communication signal from a selected one of the plurality of input optical channels into the associated output optical channel and each input lens is located and shaped to collect an optical communication signal emitted from the associated input optical channel and direct the optical communication signal towards a selected one of the plurality of output optical channels.

108. (New) A switch according to claim 87 wherein each output reticle is coupled to move with the associated output optical channel, and wherein the one or more corresponding output Moiré interference patterns vary in intensity based on a position of the associated output reticle.

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109. (New) A switch according to claim 108 comprising a controller connected to receive the output control signals from the output radiation sensors, the controller configured to determine a position of each output optical channel based on the corresponding output control signal.

110. (New) A switch according to claim 109 wherein the output optical channels comprise optical fibers.

111. (New) A switch according to claim 91 wherein each input reticle is coupled to move with the associated input optical channel, and wherein the one or more corresponding input Moiré interference patterns vary in intensity based on a position of the associated input reticle.

112. (New) A switch according to claim 111 comprising a controller connected to receive the input control signals from the input radiation sensors, the controller configured to determine a position of each input optical channel based on the corresponding input control signal.

113. (New) A switch according to claim 112 wherein the input optical channels comprise optical fibers.

114. (New) A switch according to claim 87 wherein each output reticle is coupled to move with an associated moveable optical element, and wherein the one or more corresponding output Moiré interference patterns vary in intensity based on a position of the associated output reticle.

115. (New) A switch according to claim 114 wherein a position of each moveable optical element influences an optical path of an optical communication signal coupled into the associated output optical channel.

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116. (New) A switch according to claim 115 comprising a controller connected to receive the output control signals from the output radiation sensors, the controller configured to determine a position of each moveable optical element based on the corresponding output control signal.

117. (New) A switch according to claim 91 wherein each input reticle is coupled to move with an associated moveable optical element, and wherein the one or more corresponding input Moiré interference patterns vary in intensity based on a position of the associated input reticle.

118. (New) A switch according to claim 117 wherein a position of each moveable optical element influences an optical path of an optical communication signal emitted by the associated input optical channel.

119. (New) A switch according to claim 118 comprising a controller connected to receive the input control signals from the input radiation sensors, the controller configured to determine a position of each moveable optical element based on the corresponding input control signal.

120. (New) A switch according to claim 108 comprising a plurality of output actuators, each output actuator associated with one of the plurality of output optical channels and each output actuator comprising: a magnetic member coupled to move with the associated output optical channel and a plurality of magnetically polarizable branches spaced apart around the magnetic member.

121. (New) A switch according to claim 120 wherein each magnetic member is circularly symmetric.

122. (New) A switch according to claim 121 wherein each magnetic member comprises a ring of magnetic material.

123. (New) A switch according to claim 122 wherein each ring extends around a peripheral edge of the associated output reticle.

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124. (New) A switch according to claim 123 wherein each ring comprises a ferrite material.

125. (New) A switch according to claim 121 wherein each output actuator comprises four branches equally spaced apart around the magnetic member.

126. (New) A method for coupling an input optical communication signal into a selected output optical channel from among a plurality of output optical channels, the method comprising:

generating one or more output Moiré interference patterns using first control signal radiation, the one or more output Moiré interference patterns varying with a

position of a selected moveable output optical element, the selected moveable output optical element associated with the selected output optical channel;

detecting at least a portion of the one or more output Moiré interference patterns; and

based at least in part on the detected portion of the one or more output Moiré interference patterns, determining the position of the selected moveable output optical element.

127. (New) A method according to claim 126 wherein the selected moveable output optical element comprises a selected moveable output optical fiber and determining the position of the selected moveable output optical element comprises determining a position of an end of the selected moveable output optical fiber.

128. (New) A method according to claim 127 wherein generating one or more output Moiré interference patterns comprises projecting the first control signal radiation onto an output reticle coupled to move with the selected moveable output optical fiber, the output reticle having a spatially varying pattern of interaction with radiation incident thereon.

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129. (New) A method according to claim 128 wherein determining the position of the end of the selected moveable output optical fiber comprises determining a position of the output reticle.

130. (New) A method according to claim 129 wherein the input optical communication signal is emitted by a selected input optical channel from among a plurality of input optical channels and wherein the method comprises:

generating one or more input Moiré interference patterns using second control signal radiation, the one or more input Moiré interference patterns varying with a position of an end of a selected moveable input optical fiber, the selected moveable input optical fiber associated with the selected input optical channel;

detecting at least a portion of the one or more input Moiré interference patterns; and

based at least in part on the detected portion of the one or more input Moiré interference patterns, determining the position of the end of the selected moveable input optical fiber.

131. (New) A method according to claim 130 wherein generating one or more input Moiré interference patterns comprises projecting the second control signal radiation onto an input reticle coupled to move with the selected moveable input optical fiber, the input reticle having a spatially varying pattern of interaction with radiation incident thereon.

132. (New) A method according to claim 131 wherein determining the position of the end of the selected moveable input optical fiber comprises determining a position of the input reticle.

133. (New) A method according to claim 132 wherein the input and output reticles have a spatially varying transmissivity and wherein detecting at least a portion of the one or more output Moiré interference patterns comprises detecting the first control signal radiation that has passed through the output reticle and detecting at least a portion of the one or more input Moiré interference patterns comprises detecting the second control signal radiation that has passed through the input reticle.

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134. (New) A method according to claim 132 wherein the input and output reticles have a spatially varying reflectivity and wherein detecting at least a portion of the one or more output Moiré interference patterns comprises detecting the first control signal radiation that has reflected from the output reticle and detecting at least a portion of the one or more input Moiré interference patterns comprises detecting the second control signal radiation that has reflected from the input reticle.

135. (New) A method according to claim 132 wherein each of the input and output reticles is patterned with a regular array of cells.

136. (New) A method according to claim 135 wherein each cell comprises an aperture portion and an opaque portion and wherein:

(a) detecting at least a portion of the one or more output Moiré interference patterns comprises detecting a first proportion of the first control signal radiation that is incident on and passes through the aperture portion and detecting a second proportion, smaller than the first proportion, of the first control signal radiation that is incident on and passes through the opaque portion; and

(b) detecting at least a portion of the one or more input Moiré interference patterns comprises detecting a first proportion of the second control signal radiation that is incident on and passes through the aperture portion and detecting a second proportion, smaller than the first proportion, of the second control signal radiation that is incident on and passes through the opaque portion.

137. (New) A method according to claim 132 wherein each of the input and output reticles is comprises a circularly symmetric pattern of aperture areas and opaque areas and wherein:

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(a) detecting at least a portion of the one or more output Moiré interference patterns comprises detecting a first proportion of the first control signal radiation that is incident on and passes through the aperture areas and detecting a second proportion, smaller than the first proportion, of the first control signal radiation that is incident on and passes through the opaque areas; and

(b) detecting at least a portion of the one or more input Moiré interference patterns comprises detecting a first proportion of the second control signal radiation that is incident on and passes through the aperture areas and detecting a second proportion, smaller than the first proportion, of

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the second control signal radiation that is incident on and passes through the opaque areas.

138. (New) A method according to claim 132 wherein projecting the first control signal radiation onto the output reticle comprises projecting a plurality of elongated stripes of radiation onto the output reticle and projecting the second control signal radiation onto the input reticle comprises projecting a plurality of elongated stripes of radiation onto the input reticle.

139. (New) A method according to claim 132 wherein projecting the first control signal radiation onto the output reticle comprises projecting one or more spatially periodic radiation patterns onto the output reticle and projecting the second control signal radiation onto the input reticle comprises projecting one or more spatially periodic radiation patterns onto the input reticle.

140. (New) A method according to claim 135 wherein projecting the first control signal radiation onto the output reticle comprises projecting one or more spatially periodic radiation patterns onto the output reticle, the spatially periodic radiation patterns having a period substantially equal to a spatial periodicity of the cells on the output reticle and projecting the second control signal radiation onto the input reticle comprises projecting one or more spatially periodic radiation patterns onto the input reticle, the spatially periodic radiation patterns having a period substantially equal to a spatial periodicity of the cells on the input reticle.

141. (New) A method according to claim 140 wherein the cells on the input and output reticles are arranged in rows extending substantially parallel to a first axis and columns extending substantially parallel to a second axis and wherein projecting the first control signal radiation onto the output reticle comprises projecting elongated stripes of radiation which are oriented substantially parallel to one of the first and second axes and projecting the second control signal radiation onto the input reticle comprises projecting elongated stripes of

radiation which are oriented substantially parallel to one of the first and second axes.

142. (New) A method according to claim 132 wherein projecting the first control signal radiation onto the output reticle comprises projecting at least one radiation pattern having a first wavelength onto the output reticle and projecting at least one radiation pattern having a second wavelength onto the output reticle and projecting the second control signal radiation onto the input reticle comprises projecting at least one radiation pattern having the first wavelength onto the input reticle and projecting at least one radiation pattern having the second wavelength onto the input reticle.

143. (New) A method according to claim 132 wherein projecting the first control signal radiation onto the output reticle comprises imaging a plurality of individual radiation emitting devices onto the output reticle and projecting the second control signal radiation onto the input reticle comprises imaging a plurality of individual radiation emitting devices onto the input reticle.

144. (New) A method according to claim 128 comprising moving the selected moveable output optical fiber to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.

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145. (New) A method according to claim 132 comprising moving the selected moveable output optical fiber to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.

146. (New) A method according to claim 145 comprising moving the selected moveable input optical fiber to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.

147. (New) A method according to claim 126 wherein movement of the selected moveable output optical element influences an optical path that the input optical communication signal travels when coupled into the selected output optical channel.

148. (New) A method according to claim 147 wherein generating one or more output Moiré interference patterns comprises projecting the first control signal radiation onto an output reticle coupled to move with the selected moveable output optical element, the output reticle having a spatially varying pattern of interaction with radiation incident thereon.

149. (New) A method according to claim 148 wherein determining the position of the selected moveable output optical element comprises determining a position of the output reticle.

150. (New) A method according to claim 149 wherein the input optical communication signal is emitted by a selected input optical channel from among a plurality of input optical channels and wherein the method comprises:

generating one or more input Moiré interference patterns using second control signal radiation, the one or more input Moiré interference patterns varying with a position of a selected moveable input optical element, the selected moveable input optical element associated with the selected input optical channel;

detecting at least a portion of the one or more input Moiré interference patterns; and

based at least in part on the detected portion of the one or more input Moiré interference patterns, determining the position of the selected moveable input optical element.

151. (New) A method according to claim 150 wherein movement of the selected moveable input optical element influences an optical path that the input optical communication signal travels when emitted by the selected input optical channel.

152. (New) A method according to claim 151 wherein determining the position of the selected moveable input optical element comprises determining a position of the input reticle.

153. (New) A method according to claim 149 comprising moving the selected moveable output optical element to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.

154. (New) A method according to claim 152 comprising moving the selected moveable output optical element to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.

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155. (New) A method according to claim 154 comprising moving the selected moveable input optical element to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.